Title: Geometric Line Relationships

Brief Overview:

This unit plan will take students through the process of identifying, describing, comparing/ contrasting, and constructing parallel, perpendicular, and intersecting line segments, rays, and lines.

NCTM Content Standard:

- Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes.
- Investigate, describe, and reason about the results of subdividing, combining, and transforming shapes.
- Make and test conjectures about geometric properties and relationships and develop logical arguments to justify conclusions.

Grade/Level:

3-4

Duration/Length:

3 Days; 60 minutes for each lesson

Student Outcomes:

Students will:

- Identify and describe the properties of a line segment, ray, and line.
- Compare and contrast the properties of a line segment, ray, and line.
- Identify and describe the properties of intersecting, perpendicular, and parallel lines.
- Construct parallel, perpendicular, and intersecting line segments, rays, and lines.

Materials and Resources:

Day 1

- *Geometry Pre-Assessment* (class set)
- Prior to Lesson: 4 copies of *Parts of Lines, Rays, and Segments*/ group of 4 or 5 students; cut each image, include two pieces of yarn (2 meters) and place all materials in baggie or envelope
    - Chart paper or board space for *Parts of Lines, Rays, and Segments* activity results
- *One-Line Drawing Resource* (one for each small group)
- *Look, Say, Write* chart; front and back (class set)
- *Find and Color Resource* (class set)
- *Day 1 Re-Teach Instructions and guiding Questions* (1 copy)

- *Day 1 Enrich Instructions and guiding Questions*
- *Roller Coaster Scene* (for enrichment group)
- *Day 1 Exit Ticket* (class set)

Day 2

- *Line Race Clue Cards* handout (1 copy); cut and place in a pile
- *Prior to Lesson:* Place 4 coffee stirrers, 8 toothpicks, and 8 Dots candies or marshmallows in a small bag for each student
- *Day 2 Vocabulary Resource* (1 copy)
- 2 boxes of long spaghetti noodles
- 2 rolls of tape/ group of students
- BrainPop *Parallel and Perpendicular Lines* video (link provided in lesson plan)
- Noodle Mat (1/ partner)
- *Parallel, Intersecting, and Perpendicular* handout (class set)
- *Map Frenzy* (class set)
- *Memory Cards Resource*; cut and place in bag or envelope/ every group of 2-3 students
- Construction paper and scissors for mini flipbook for re-teaching (if applicable)
- *Line Attack* activity for enrichment group (if applicable)
- *Day 2 Exit Ticket* (class set)

Day 3

- *Memory Cards Resource*; from Day 2 Extension
- *Sketch Challenge* (class set)
- *Sketch Challenge Teacher Resource* (if needed)
- Board space to display discussion questions
- *Step and Sketch Classwork* handout (class set)
- *I Spy…Lines!* activity (class set)
- *Say, Look, Combine* chart for re-teaching (if applicable)
- *Geometry Challenge* for enrichment group (if applicable)
- *Day 3 Exit Ticket* (class set)
- *Geometry Unit Summative Assessment* (class set)

Development/Procedures:

Day 1
Pre-assessment

- Complete the *Geometry Pre-Assessment*. The assessment will require students to demonstrate their pre-unit understanding of identifying, describing, and constructing line segments, rays, and lines, as well as apply relational vocabulary of parallel, perpendicular, and intersecting. An answer key is provided.

Engagement

- Use *One-Line Drawing Resource*. Explain directions before distributing materials. Students will work together to create a cohesive image using only one line each time they get a turn. They will pass the paper to their left, and will work without talking.
- Assign roles to students in each group.
- Distribute *One-Line Drawing Resource* and allow 3-5 minutes for the activity.
- Use teacher questions below after the activity to guide discussion toward exploration of the smaller images (lines, line segments, and perhaps lines) that make up the larger image they created as a group:
    - How did your illustration change as you passed it around your group?
    - Why do you think we completed this activity in silence?
    - How did you pick your title?
    - Do you see any shapes within your picture? Which ones?
    - Does your illustration contain any lines that run into each other? What do you call lines that run into each other?
    - Do you see any line segments? How do you know?
    - Do you see any rays? How do you know?

Exploration

- Use the four copies (cut out) of *Parts of Lines, Rays, and Segments*. Distribute eight of each image in addition to at least four pieces of yarn or string to each group of 4 or 5 students. The yarn or string will be used to represent the straight segments that compose the lines, rays, or segments.
- Direct students to create as many combinations of lines, rays, and line segments as they can and leave them flat on their desks. Provide 1-3 minutes for students to construct and discuss examples of each type of line.
- Ask students what they created and what parts they used to create the examples and why.
- Record student findings on the chart paper or on the board. Even if students do not have examples of each, record their non-examples, which will serve as a closing piece at the end of the lesson. These images will be used to confirm or refute ideas of what components make up a line, line segment, and ray during the explanation section.

Explanation

- Use available technology to display multiple versions of images during explanation of each line segment, ray, or line. Take students through each example, and use students as "models" to demonstrate the components of each image. For example, while explicitly discussing the elements of a line, have two students model by standing at the front of the classroom holding an arrowhead on either side, as well as one or several students model the line segment. String can be used to demonstrate that a line or one side of a ray continues in one direction without stopping. Correlate the various versions of each image with the student models. Have the students move and manipulate direction of lines to show that regardless of direction, as long as they have the same properties, it is still an example of the particular type of line students are modeling. Use the following questions to guide conversation:
    - What parts make up this type of line?
    - What does the arrow represent? What does the endpoint represent?

        - If the direction is changed, does the type of line change as well? How do you know?
        - What are some ways we can distinguish one ray/ line segment/ line from another? How can we tell them apart?
    - Use the *Look, Say, Write* chart (front side) to explicitly record different representations of each example (how it looks, how to verbally say it, and how to write it). Restate the mathematical definition (including labeling/identification) of each example. There are two of each type of line. Use the first example to model, and use the second example to have students complete with a neighboring partner or group.
    - Use the last example on the front page of the *Look, Say, Write* chart to model using the given clue to fill in the other two versions of the type of line.
    - Direct students to complete the next examples with a partner. Use the Think-Pair-Share strategy, or one similar to it, to gradually release responsibility of completing chart independently.

Extension

- Direct students to complete the remaining examples of *Look, Say, Write* chart (back) independently. An answer key is provided.
- Distribute *Find and Color* activity (students will identify each image using a different color).
- Use differentiation activities as an extension of *Find and Color* activity using grouping based on performance on the *Look, Say, Write* chart during the lesson.

Differentiation

- Reteach
    - Construct a ray, line, line segment using provided properties of each
    - Use *Day 1 (Re-Teach) Instructions and Guiding Questions* to guide students through constructing lines, line segments, and rays using straws, dot candy, and toothpicks. Encourage student thinking by using the questions provided on the handout.

- Enrich
    - Distribute *Roller Coaster Scene* to each student, along with crayons or colored pencils. Students will create a roller coaster with guidelines (10 line segments, 4 intersecting lines, and 6 rays) to demonstrate their understanding of today's concepts.
    - Use *Day 1 (Enrich) Instructions and Guiding Questions* to encourage student discussions with each other during and after completion of activity. A sample is provided.

Evaluation

- Distribute the *Day 1 Exit Ticket* to each student. Have students complete independently, and check their work when finished. Once class is finished the exit ticket, refer back to the chart created during the Exploration activity. Use this time to discuss examples of each type of line, non-examples, and how they know. Brainstorm real-life examples of each kind of line to conclude lesson. An answer key is provided.

Day 2

Engagement

- Use *Line Race Clue Cards* handout to determine materials needed for each group of 4 or 5.
    - Read the following directions to the students:
      "Do not open your bags until I have given you all instructions. I am going to read clues from a card about the parts of lines, line segments, and rays. As I read each clue, use the materials in your bag to construct the line, line segment, or ray that I am describing. Once you know the word for what you have constructed, silently raise your hand to share your answer with the class."

- Use clue cards on *Line Race Clue Cards* to read clues to students. The students who silently raises their hand and shares the right answer may read the second clue card. Continue until clue cards are complete. As an option, you can read all the clues while students record their answer on dry-erase boards and display it when they think they have an answer. You can also wait until all students appear to have answered and have all students display their response at the same time before revealing the answer. Have students return materials to bags and collect materials.

Exploration

- Place a handful of whole spaghetti noodles at each table. Students will be working in pairs to explore what parallel, perpendicular, and intersecting noodles look like.
- Use available technology to display authentic examples of parallel, perpendicular, and intersecting lines. Include the respective term with the images, but do not include the definition. Slides 1-3 on the *Day 2 Vocabulary Resource* demonstrate example images. Display one term (including the example images) at a time. As each compilation of examples of parallel, intersecting, and perpendicular images is displayed on the screen or board, challenge students to use the examples to deduct what each term means, and to show the term using their spaghetti noodles. Use the sample questions below to encourage students to think about what each word means:
    - What pictures do you see on the board? What do they have in common?
    - What do you and your partner think parallel/intersecting/ perpendicular means?
    - Can you and your partner create an example of parallel/ intersecting/ perpendicular lines with your noodles?
    - How many different types of parallel/ intersecting/ perpendicular lines can you make?
- Have students place the noodle examples they construct on the *Noodle Mat* handout. If partners finish early, encourage them to find additional examples. Students are using this time to explore; noodles are not being taped down to the mat at this stage of the lesson.

Explanation

- Transition into the teacher explanation by directing student's attention to the screen . Use BrainPop website to play the Parallel and Perpendicular Lines video http://www.brainpop.com/math/geometryandmeasurement/parallelandperpendicularlines The video will give a brief, comprehensive explanation of each term (parallel, perpendicular, and intersecting) and provide more authentic examples of each.
- Provide students with 1-3 minutes after video to modify their noodle creations with their partner based on the new information (including definitions) presented. Briefly discuss what changes students made, if any, and why. Use following questions to discuss placement of noodles based on the terms given:
    - What did your parallel lines look like before the video? What do they look like now? Why did you and your partner choose to make the changes you did?
    - Are there other ways you can make parallel lines?
    - What did your perpendicular lines look before the video? Your intersecting lines? What do they look like now? Why did you and your partner choose to make the changes you did?
    - Are there other ways to make perpendicular and intersecting lines? How are perpendicular lines different than intersecting lines? How are they the same?
- Collect the *Noodle Mat*. No noodles should be taped down.
- Distribute a copy of the *Parallel, Intersecting, and Perpendicular* handout to each student. They will use the handout to tape down additional examples of each term, and fill out the definition during direct instruction. An answer key is provided.
- Direct students to the initial slides used in the exploration stage to focus on one term at a time. Display each term. The slide will now include the mathematical definition of parallel, perpendicular, and intersecting. *Day 2 Vocabulary Resource* slides 4-6 show an example of how the information can be presented.
- Distribute a copy of the *Parallel, Intersecting, and Perpendicular* student note-taking sheet to each student. They will use this handout to copy definitions of each term, and tape down noodles to represent various examples of each.
- Explain and clarify each term. For each term (parallel, perpendicular, and intersecting), allow time for students to copy the definition into their *Parallel, Intersecting, and Perpendicular* note-taking sheet. Take time to explain the symbol for each term. Explain that the symbol for intersecting means "not parallel."
- For each term (parallel, perpendicular, and intersecting), allow time for students to copy the definition into their *Parallel, Intersecting, and Perpendicular* note-taking sheet.
- Give students 1-3 minutes to then break, create, and tape down examples of the term being explained on their note-taking sheet. Encourage them to include at least two different examples.
- Follow the same steps until students have filled in definition for each term, and have taped down at least two examples of each line relationship (parallel, perpendicular, and intersecting).

Extension

- Distribute *Map Frenzy* resource to the students. For this activity, students will need to apply the vocabulary acquired today to answer questions about the relational position of streets and buildings on a map. Model the first question and then have students work in pairs or small groups to answer the second and third questions (if more support is

needed), and have students complete the rest of the activity independently. An answer key is provided.
- Have a baggie, envelope or container with the *Memory Cards Resource* matching game components cut up and readily available for students to play once finished with their *Map Frenzy*. Students may play independently to match the terms with its visual or verbal representation, or play with a partner. The cards will also review terms from day one's lesson.

Differentiation

- Reteach
  - Have students fold construction or computer paper in half ("hotdog" style) and cut the top flap in thirds to create a mini-flipbook. Guide students through each term (parallel, intersecting, and perpendicular)—one flap/third for each term. On the top flap have students write the term, and on the inside top flap have them copy the definition from the *Parallel, Intersecting, and Perpendicular* resource they completed during the explanation stage once more to reinforce vocabulary.
  - Use the remaining space on the flipbook to create one example of each term using noodles.
  - Guide students to point to each part of the definition on the corresponding elements on their noodle creation. An example of teacher-directed dialogue may be:
    - Perpendicular means "Two lines that intersect to form 90° angles." Point to each noodle. You should have two. Point to the intersection on your noodle creation. Now, point to one 90° angle on your noodle creation. Are there more 90° angles?
    - Does your noodle creation match the definition for perpendicular?
- Allow the students to tape down examples of each term once they confirm it matches the given definition. Encourage students to use the vocabulary to explain, confirm, or refute their examples and/or non-examples. Continue guided process until students have completed the review flipbook.

- Enrich
  - Direct students who have mastered the lesson concepts to complete the *Line Attack* activity in which they will analyze their first and last name (all capital letters) to identify parallel, intersecting, and perpendicular lines.

Evaluation

- Distribute *Day 2 Exit Ticket* to each student. Allow 3-5 minutes for students to complete the questions independently. An answer key is provided.
- Play a brief game of "I Spy" in which one student at a time can be the "spy" and identify an object using clues containing today's vocabulary and include previously learned vocabulary (types of lines, polygons, angles if applicable). Conclude by reviewing vocabulary from today's lesson. Students can demonstrate examples with their arms as you review together.

Day 3

Engagement

- Use memory cards from Day 2 Extension to play a vocabulary matching game as a whole class. Distribute one card to each student. Try to distribute all compatible cards (example: pass out the term "parallel" as well as the picture image of parallel lines).
- Give students 2-3 minutes to find their compatible partner/ card. Have students sit next to their partners when finished and discuss their cards, and how they know they have the right match.
- During the activity, walk around and note any challenges during the matching game.
- Discuss any misconceptions or difficulties in matching different representations of vocabulary terms. If students master matching cards quickly, have them switch with someone else, and play again.

Exploration

- Distribute a copy of the *Sketch Challenge* resource. Have students take out a ruler to use during the challenge. Allow 3-5 minutes for students to complete the challenge exploration.

  Explain the directions for *Sketch Challenge*. Students will need to follow each given set of directions in the order they are given to create a final image that matches the guidelines. Encourage students to read each direction carefully, and to keep eyes on their own paper.
- Walk around the room to find two successful student examples. If no students have produced a geometrically accurate image that matches the guidelines given on the challenge, use *Sketch Challenge-Teacher Copy Resource* for the following part.
- Display the questions below on a screen or on the board. Give students 1-2 minutes to look at the final sketches their neighbor or group members produced, and discuss similarities and differences:
    - Do the sketches we made for each step look the same? How are they similar? How are they different?
    - Do our final images look more similar to each other or more different?
    - Are both of our final images geometrically correct even though they may look different?
- Bring class together for a whole group discussion of the same questions above. At this point, if there are two student samples that are geometrically accurate, display them to encourage discussion. If not, use *Sketch Challenge—Teacher Copy Resource* to compare and contrast final images. The conclusion of the exploration should be that geometric images with the same guidelines can vary due to multiple variations of the same linear relationship.

Explanation

- Use *Step and Sketch Classwork* resource to begin direct instruction of following given guidelines to create a geometrically accurate final image. For the first set of four directions, students will copy the teacher model as he/she demonstrates accurate representation of types of lines and relationships. A sample is included.

- Have students work with partners to complete the second set of four directions together. Have students alternate completing the steps (partner A will complete steps 1 and 3; partner B will complete steps 2 and 4). While students work to complete the second question, post the following questions to encourage conversation (keep these questions posted for remainder of explanation):
    - Did your partner create the same lines you would have? Are they facing the same direction you would have placed the lines?
    - How is what your partner did the same or different from what you would have done?
    - How is it possible to have two different answers that are both correct?
- Encourage students who are still struggling with vocabulary to use Day 2 resources (Re-teach flipbooks or the *Parallel, Intersecting, and Perpendicular* note-taking sheet with noodle examples and definitions).

Extension

- Give students 3-4 minutes of silent work time to complete the third set of four directions independently. Encourage them to use their resources to check their work to ensure accuracy. At this time, walk around the room to identify needs or misconceptions.
- Have students talk to their neighbor to discuss the questions posted. Challenge them to find and count the differences between their two completed images.
- Come together as a class to discuss differences in image. Emphasize that geometric images with the same guidelines can vary due to multiple variations of the same linear relationship.
- Collect student work.
- Distribute *I Spy…Lines!* activity. This activity challenges students to find the differences between two linear images. Students should complete activity independently, but provide support as necessary. An answer key is included.

Differentiation

- Reteach
    - Use the *Say, Look, Combine* chart to scaffold creation of linear images.
        - Encourage students who are still struggling with vocabulary to use Day 2 resources (Re-teach flipbooks or the *Parallel, Intersecting, and Perpendicular* note-taking sheet with noodle examples and definitions). An answer key is provided.
    - Guide students through the process of creating an accurate image by having them read aloud the guideline (example: "line AB"). Then draw the direction on its own under the "look" section of the chart. At this point, check student work to ensure they have drawn the image the direction gives correctly.
    - Guide students to combine the individual image to the previous direction under the "combine" blank area of the handout. This is the area in which students will compile all of the directions/guidelines into one cohesive image.

- Enrich

- Distribute *Geometry Challenge* to students who have mastered creating accurate images with given instructions. Students will be creating guidelines for a provided image.
- Encourage students to work methodically to include a direction for each part of the image.
- Then, have students create their own directions and switch with a partner that will follow the student-written guidelines.

Evaluation

- Distribute *Day 3 Exit Ticket*. Allow 3-5 minutes for students to complete independently. Close the lesson by watching the So Many Lines by Rappin' Mathematician (http://www1.teachertube.com/viewVideo.php?video_id=78388). This brief music video clip (3 minutes) shows a wide variety of authentic, real world examples of different kinds of lines and uses vocabulary introduced and applied throughout this unit.

Summative Assessment:

The *Geometry Unit-Summative Assessment* will inform teachers as to the progress made by each student toward acquiring and mastering objectives for this unit. Each question on this assessment aligns with the objectives that guided the instruction each day. Questions 1-2 assess student knowledge of identification of types of lines. Questions 3-5 require students to construct parallel, perpendicular, and intersecting line relationships. Question 6 assesses critical thinking skills that require students understand, compare, and contrast the three different kinds of lines, their properties, and relationship to one another. Finally, the Brief Constructed Response item requires students to apply vocabulary to name, identify, and explain an image and the lines within.

Authors:

Emily Morsberger
Hawthorne Elementary School
Baltimore County Public Schools

Natalia Seets
Hickory Elementary School
Harford County Public Schools

Name: _____

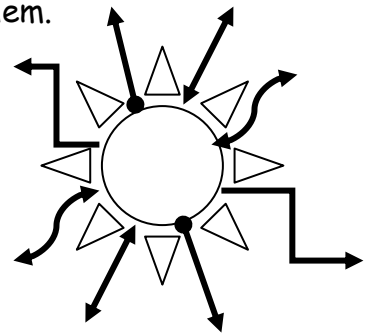
Geometry Unit Pre-Assessment

Use what you know to answer the questions below.

1. Select the statement that best describes the image below.

A. This image is a line segment.
B. This image is a line.
C. This image is a ray.

2. Find the two rays in the sun below. Circle both of them.



3. Draw a line parallel to the line below.	4. Draw a line perpendicular to the line below.	5. Draw a line that intersects the line below.

6.

Step A

Look at the image below. Tell whether it is a line, a ray, or a line segment.

 This is a _____.

Step B

Explain how you know your answer is correct.

_____

_____

_____

_____

Name: _____

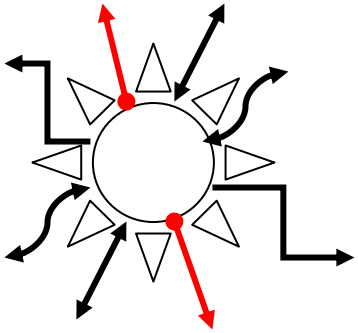
Geometry Unit Pre-Assessment Answer Key

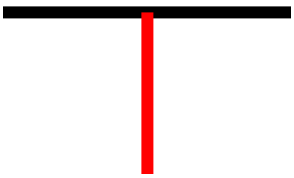
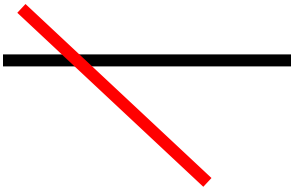
Use what you know to answer the questions below.

1. Select the statement that best describes the image below.

A. This image is a line segment.
B. This image is a line.
C. This image is a ray.

2. Find the two rays in the sun below. Circle both of them.



3. Draw a line parallel to the line below.	4. Draw a line perpendicular to the line below.	5. Draw a line that intersects the line below.
		

6.

Step A

Look at the image below. Tell whether it is a line, a ray, or a line segment.

This is a line segment.

Step B

Explain how you know your answer is correct.

A line segment has two endpoints with a line connecting the endpoints. The line above has exactly two endpoints with one line connecting them.

One-Line Drawing

Roles for Each Group Member

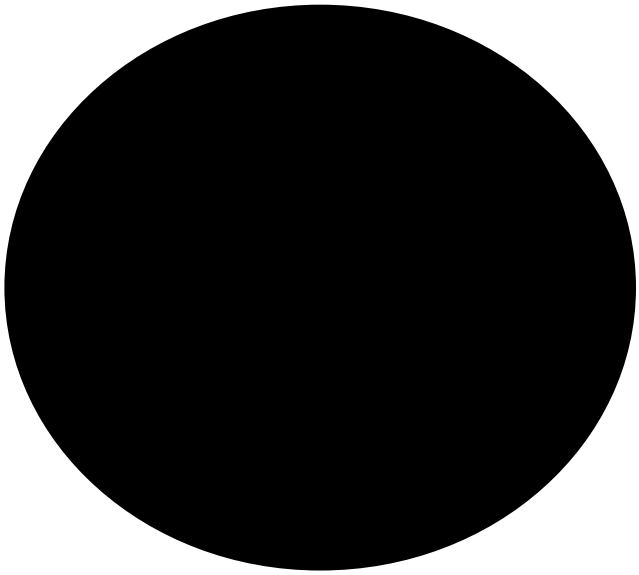
Taskmaster: collects materials
Recorder: writes the name of the picture
Leader: begins the construction of the picture
Spokesperson: organize the presentation to the class

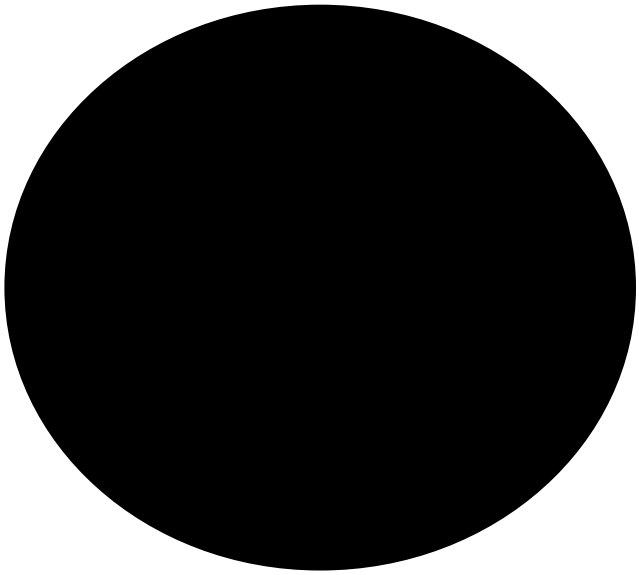
Goal: To produce an illustration constructed of straight lines only.

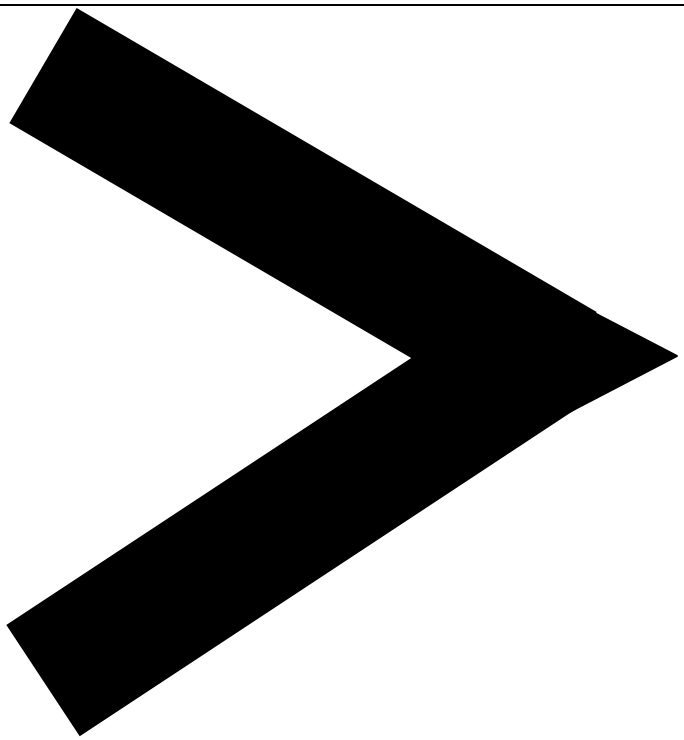
Rules:

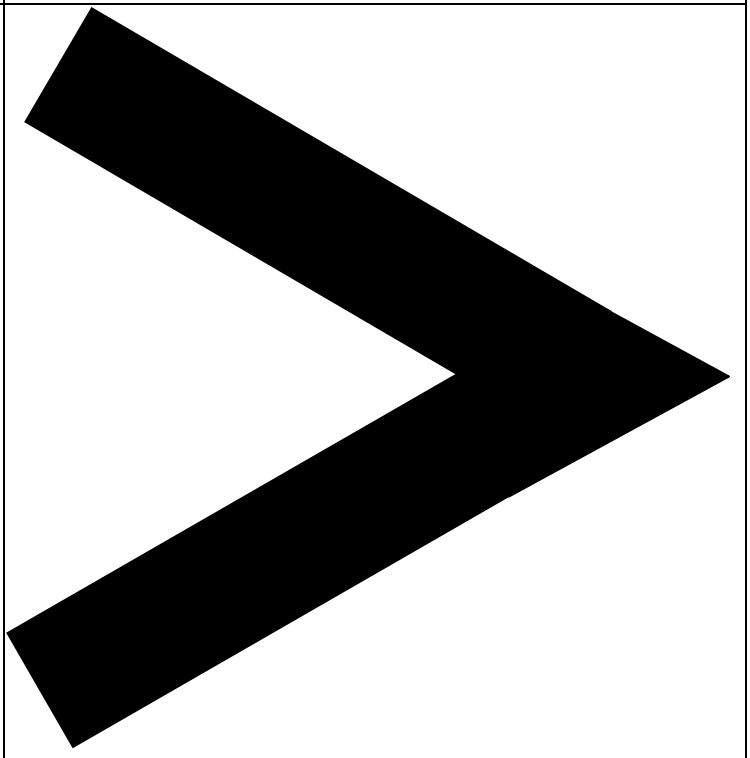
1.) *No one may talk* during construction of your picture. You will get to discuss your work later!
2.) Each person may *only add ONE line* to the picture for each turn. *One turn consists of anything that you can create without lifting your pencil. Once your pencil is lifted, you must pass the paper to the left.
3.) When a group member feels that the construction of your picture is finished, they may hold up the picture to the rest of the group and nod. If everyone else nods to agree that the construction is finished, place the paper face down on the table and wait silently for other groups to finish. If someone disagrees and does not think the picture is complete, they shake their head and the paper continues to rotate through the group.
4.) Once all groups have finished, your teacher will allow you to decide on a title for your illustration.

Parts of Lines, Rays, and Segments





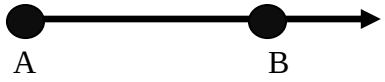
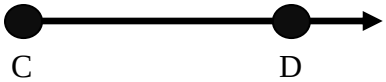
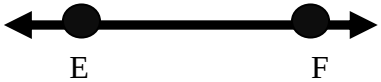




Look, Say, Write!

Name: _____ **Date:** _____

Fill in the missing information. Use your knowledge of lines, line segments, and rays to complete the empty boxes.

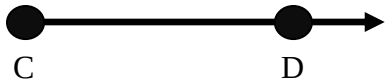
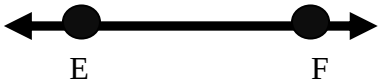
Look 	Say 	Write 
	**Ray AB**	$\overrightarrow{AB}$
		
	**Line EF**	$\overleftrightarrow{EF}$
		
	**Line segment IJ**	$\overline{IJ}$
		
	Ray MP	

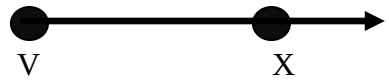
Look 	Say 	Write 
		$\overrightarrow{\quad}$
		$\overleftrightarrow{LM}$
	Line GF	
	Line segment SR	
		$\overline{\quad}$
	Ray WX	
		
		$\overline{CB}$

Look, Say, Write!

Name: _____ **Date:** _____

Fill in the missing information. Use your knowledge of lines, line segments, and rays to complete the empty boxes.

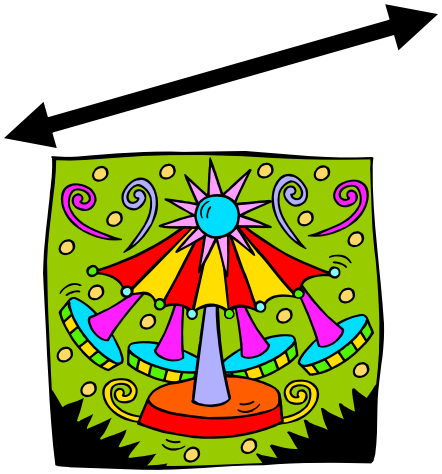
Look	Say	Write
	**Ray AB**	$\overrightarrow{AB}$
	**Ray CD**	$\overrightarrow{CD}$
	**Line EF**	$\overleftrightarrow{EF}$
	**Line GH**	$\overleftrightarrow{GH}$
	**Line segment IJ**	$\overline{IJ}$
	**Line segment KL**	$\overline{KL}$
	**Ray MP**	$\overrightarrow{MP}$

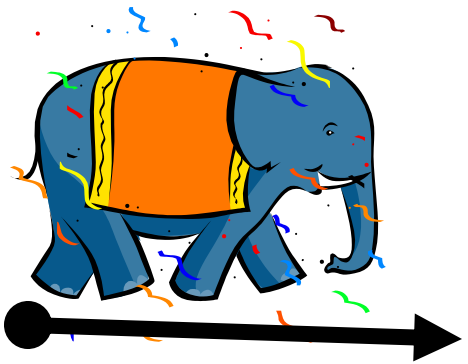
Look	Say	Write
	**Ray VX**	$\overrightarrow{VX}$
	**Line LM**	$\overleftrightarrow{LM}$
	**Line GF**	$\overleftrightarrow{GF}$
	**Line segment SR**	$\overline{SR}$
	**Line segment YT**	$\overline{YT}$
	**Ray WX**	$\overrightarrow{WX}$
	**Line DS**	$\overleftrightarrow{DS}$
	**Line segment CB**	$\overline{CB}$

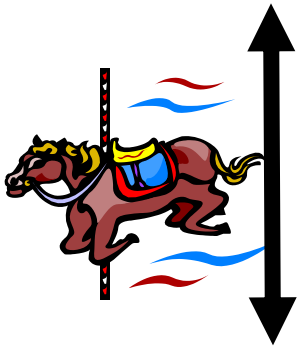
Name: _____

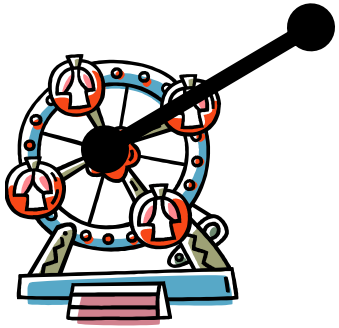
Find and Color...

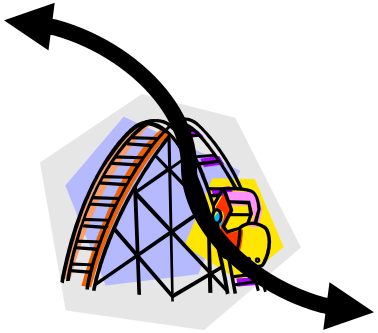
Color all of the rays blue.
Color all of the lines red.
Color all of the line segments green.







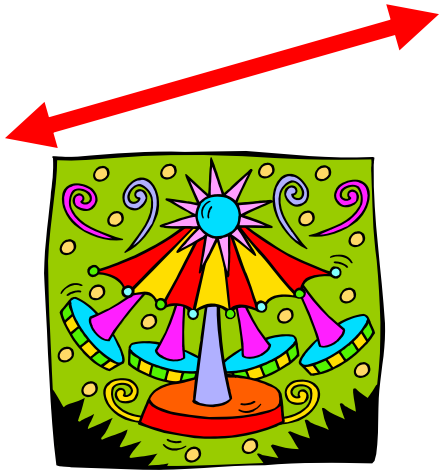


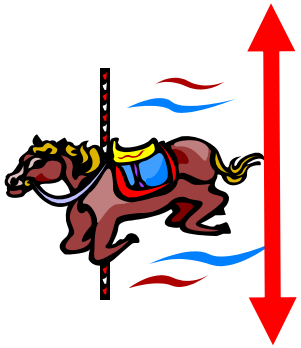


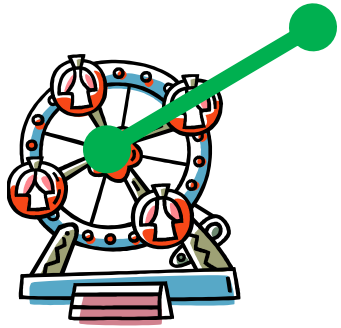
Name: _____

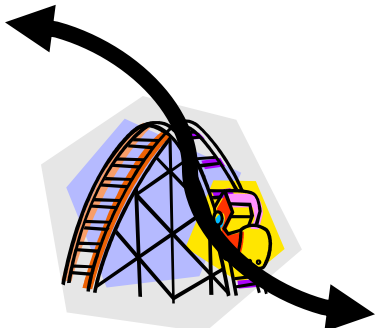
Find and Color...

Color all of the rays blue.
Color all of the lines red.
Color all of the line segments green.









This is a non-example of a line. Though it has one arrowhead at each end (two total), it does not have a straight line in between.

Day 1 Differentiation (Re-teach) Instructions and Guiding Questions

Constructing Line Segments, Rays, and Lines using Toothpicks and Coffee Stirrers

Re-teaching should be based on student performance on small group and independent work for today's lesson. This re-teaching activity can be done with a small group or whole class.

Materials Needed (for each group of 4 students):

- 8 coffee stirrers or straws ; will represent line segment
- 8 dots or marshmallows (anything that is round to represent an endpoint, and that will stick to the coffee stirrers)
- 8 toothpicks; will represent the arrowhead
- Construction paper (optional)

Directions:

- Explain to students that each coffee stirrer/ straw will represent the segment, the dot/ marshmallow will represent the endpoints, and two toothpicks will come together to represent the arrowhead. Model one or have one created to show students how one would look.

- Use the verbal cue to choose a ray, line segment, or line for students to work on. Once you have determined which you will work on first, students will work together to gather the materials (components) of that image. For example, if you say "ray," students should gather one dot, one coffee stirrer, and two toothpicks.

  Guiding Questions

  *How do you know what parts/materials to pick up?
  *How are you deciding which parts you don't need?
  *Is there more than one way to put your materials together?
  *Does it matter which way the image is facing? How do you know?

- Have students work together to compile the components of each image together. Continue dictating and guiding which image students will compose, and gradually have students create at least one independently depending on

the level of support required. Continue asking guiding questions to encourage discussion and student thinking.

- **Optional Extension for RE-teaching**: Have students glue down one of each example (a ray, line segment, line) on construction paper, and label the "endpoints" to give each image a name. Have students refer back to the Look, Say, Write chart from the Explanation part of the lesson for support in naming and verbalizing the image.

Day 1 Differentiation (Enrich) Instructions and Guiding Questions

Constructing a Roller Coaster Scene using Guidelines for Line Segments, Rays, and Lines

This enrichment opportunity can be provided to students who have shown mastery on the small group and/or independent work for today's lesson. This enrichment activity can be done in a small group (self-directed) or whole class.

Materials (one/student):

- Roller Coaster Scene handout
- Ruler
- Colored pencils/ markers/ crayons

Directions:

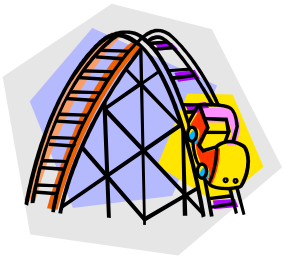
- Explain to students that they will be carefully reading directions to create their own roller coaster scene using the guidelines provided on the handout. Modeling can be provided, but should be limited.

Guiding Questions:

*How are you organizing your independent images/ segments (includes rays, line segments, and lines) to create a bigger image of a roller coaster?
* How are you deciding where to place the images?
* What challenges are you coming across as you put your images together?
*How are you representing the components of each image (endpoints, segments, and arrowheads)?
*Does the direction each is facing matter? Why or why not?
*How are you showing the differences between rays and line segments, and lines?

Name: _____

Roller Coaster Scene



Create a roller coaster scene. Be creative, but it **must include**…

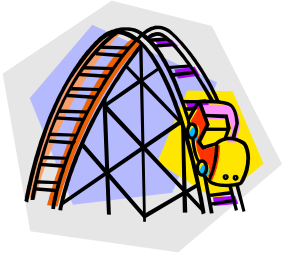
At least 10 line segments

At least 4 intersecting lines

At least 6 rays

Name: _____

Roller Coaster Scene -Teacher Key



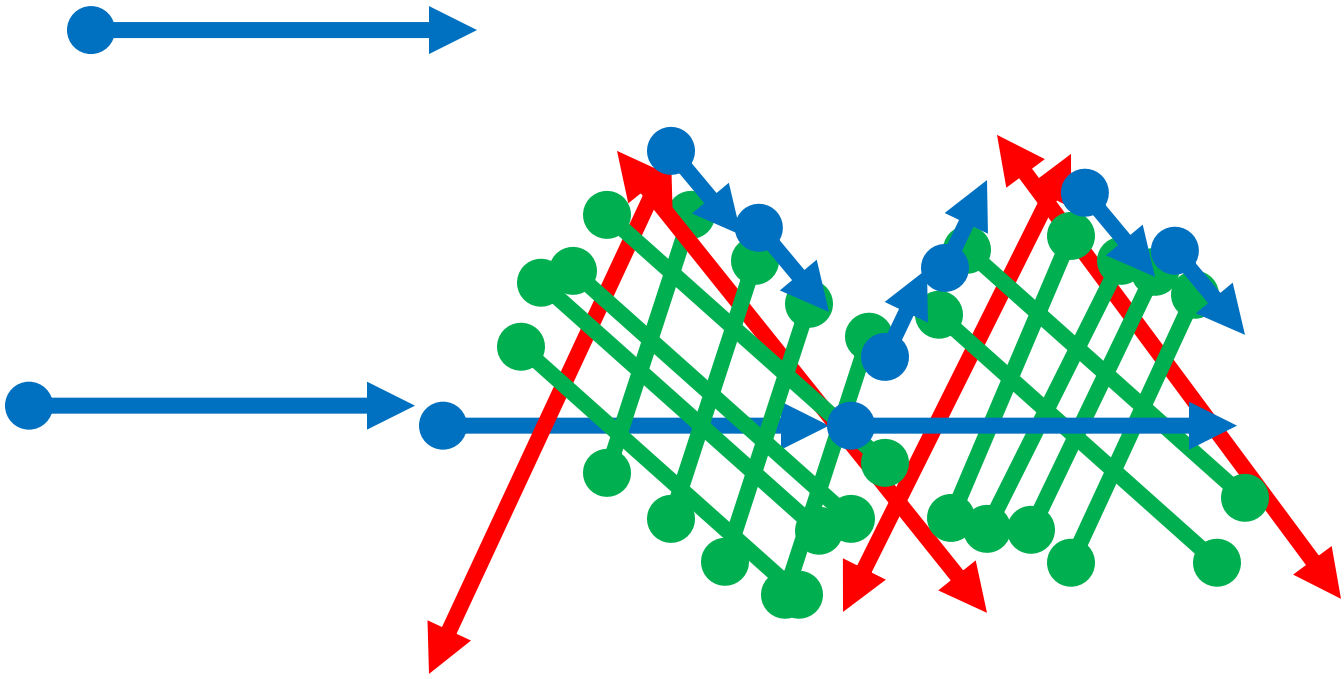
Create a roller coaster scene. Be creative, but it **must include**…

At least 10 line segments

At least 4 intersecting lines

At least 6 rays

Roller Coaster This Way!



DAY ONE
EXIT TICKET

Name: _____

Date: _____

1.) Fill in the missing information in the chart below. Use what you know about lines, line segments, and rays as you work.

Look	Say	Write
J K		
	Line WS	
		EF

BONUS: In your own words, explain what a **line segment** is. Be sure to include all parts of a line segment in your explanation.

_____

_____

_____

DAY ONE
EXIT TICKET

Name: _____

Date: _____

1.) Fill in the missing information in the chart below. Use what you know about lines, line segments, and rays as you work.

BONUS: In your own words, explain what a **line segment** is. Be sure to include all parts of a line segment in your explanation.

_____

_____

Look	Say	Write
J K		
	Line WS	
		EF

DAY ONE
EXIT TICKET

Name: _____ Date: _____

1.) Fill in the missing information in the chart below. Use what you know about lines, line segments, and rays as you work.

Look	Say	Write
	RAY JK	$\overrightarrow{JK}$
	Line WS	$\overleftrightarrow{WS}$
	Line segment EF	$\overline{EF}$

BONUS: In your own words, explain what a **line segment** is. Be sure to include all parts of a line segment in your explanation.

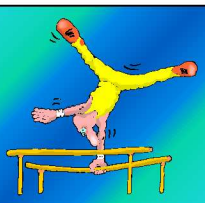
A line segment has two endpoints and a straight line in between the two endpoints. Each end point has a letter that represents it.

Line Race – Clue Cards

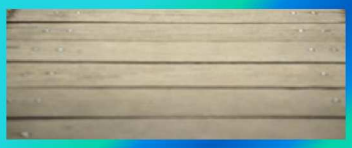
Clue #1: I have one straight line. **Clue #2:** At one end of my straight line I have an arrow. **Clue #3:** At the other end of my straight line I have am endpoint. **What am I?**	**Clue #1:** I have one straight line. **Clue#2:** I have an endpoint at both ends of my straight line. **What am I?**	**Clue #1:** I have one straight line. **Clue #2:** I have an arrow on both ends of my straight line. **What am I?**
Clue #1: I have one straight line. **Clue #2:** On the right end of my straight line, I have an arrow. **Clue #3:** On the left end of my straight line I have another arrow. **What am I?**	**Clue #1:** I have one straight line. **Clue #2:** On the left end of my straight line, I have an endpoint. **Clue #3:** On the right end I have an arrow. **What am I?**	**Clue #1:** I have one straight line. **Clue #2:** On the left end of my straight line I have and endpoint. **Clue #3:** On the opposite end, I also have an endpoint. **What am I?**

Day Two Vocabulary Resource

1

Parallel




2

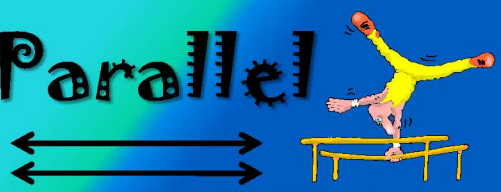

Intersecting


3


Perpendicular


4

Parallel



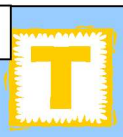
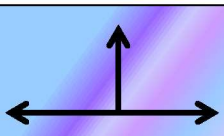
- Two lines, line segments, or rays that do not intersect.
- Parallel lines never touch.


5


Intersecting

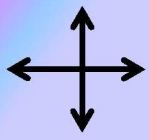
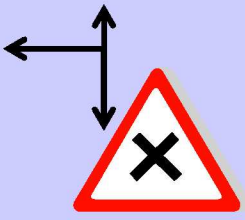
Two lines, line segments, or rays that share exactly one point.

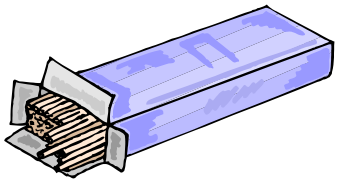

6

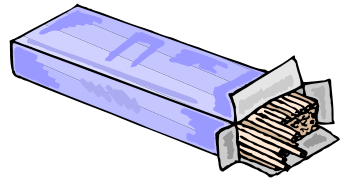

Perpendicular

Two lines that intersect to form exactly four 90° angles.



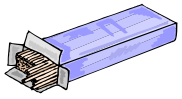
Noodle Mat



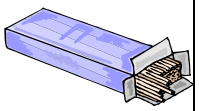
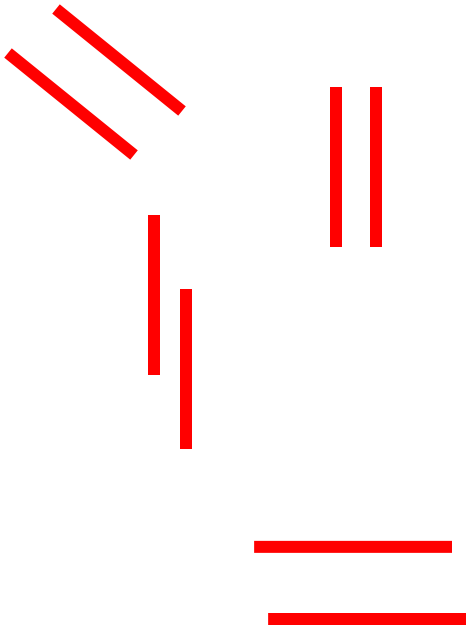
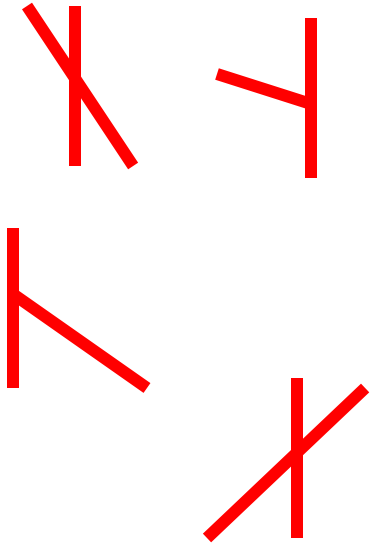
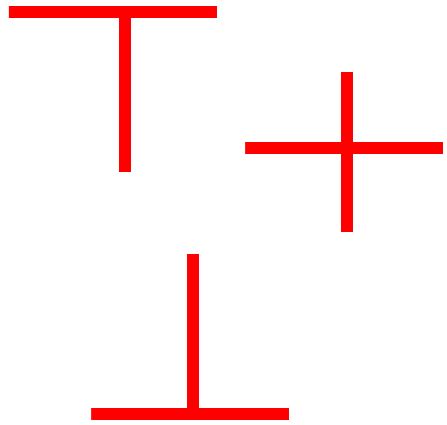
Directions: Use the spaghetti noodles to create an example of each term below.

Parallel	Perpendicular	Intersecting

Parallel, Intersecting, and Perpendicular

	Parallel	Intersecting	Perpendicular
 Noodle Examples			
Definition	Two lines, line segments, or rays that _____intersect. Parallel lines _____touch.	Two lines, line segments, or rays that _____ exactly _____ point.	Two lines that intersect to form _____ angles.
Symbol	$\parallel$	$\nparallel$ **(This symbol means NOT PARALLEL)**	$\perp$

Parallel, Intersecting, and Perpendicular- Teacher Key

	Parallel	Intersecting	Perpendicular
Noodle Examples 			
Definition	Two lines, line segments, or rays that do not intersect. Parallel lines never touch.	Two lines, line segments, or rays that share exactly exactly one point.	Two lines that intersect to form right/ square/90° angles.
Symbol	$\parallel$	$\nparallel$ (This symbol means NOT PARALLEL)	$\perp$

Map Frenzy

Directions: Use the map below to answer the questions.

3rd Grade City

1. Name two streets that are parallel.

_____

2. Name two streets that intersect.

_____

3. Name two streets that are perpendicular.

_____

4. Draw and name a street that is parallel to Route 3.

_____

5. Which statement is **not true?**

Ⓐ Line Lane and Route 3 are parallel to each other.
Ⓑ Learning Avenue and Geometry Way are perpendicular to each other.
Ⓒ Smart Street intersects Learning Avenue.
Ⓓ Route 3 is perpendicular to Geometry Way.

Map Frenzy (Teacher Key)

Directions: Use the map below to answer the questions.

3rd Grade City

1. Name two streets that are parallel.

Geometry Way and/ Learning Avenue/ Smart Street; Line Lane and Route 3

_____

2. Name two streets that intersect.

Route 3 and Geometry Way/ Learning Avenue/ Smart Street; Line Lane and Geometry Way/ Learning Avenue;

_____

3. Name two streets that are perpendicular.

Route 3 and Geometry Way/ Learning Avenue/ Smart Street; Line Lane and Geometry Way/ Learning Avenue

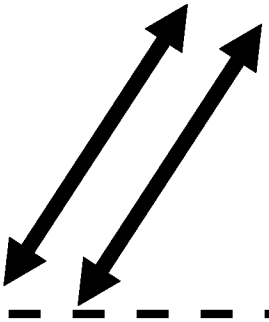
_____

4. Draw and name a street that is parallel to Route 3. (Accept any answer that is parallel to Route 3).

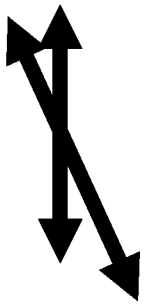
5. Which statement is **not true**?

Ⓐ Line Lane and Route 3 are parallel to each other.
Ⓑ Learning Avenue and Geometry Way are perpendicular to each other.
Ⓒ Smart Street intersects Learning Avenue.
Ⓓ Route 3 is perpendicular to Geometry Way.

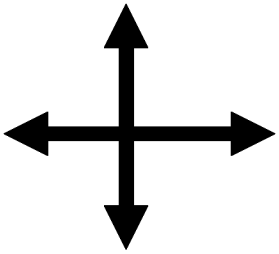
Parallel



Intersecting

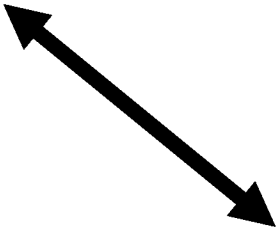


Perpendicular

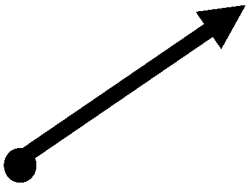


$\overline{XY}$

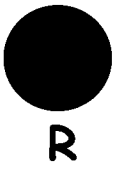
Line



Ray

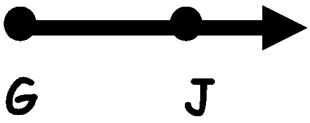


Endpoint R



Line Segment AB

Ray GJ



$\overleftrightarrow{SR}$

Line SR

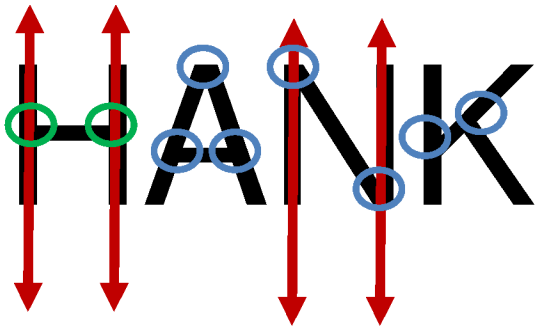
LINE ATTACK!

Name: _____ Date: _____

Directions: Write your name in all uppercase letters with straight lines. Search each letter of your name for examples of parallel, intersecting, and perpendicular lines. Color each type of line according to the key below.

KEY: Parallel Lines – Color **Red**
Intersecting Lines – Circle Intersection **Blue**
Perpendicular Lines – Circle Perpendicular Intersection **Green**

Example:



First Name

Last Name

Day Two
Exit Ticket

Name: _____ Date: _____

1. Match the term with the correct symbol by writing the correct letter on the line next to the term.

Intersecting ____
Parallel ____
Perpendicular _____

Ⓐ 

Ⓑ 

Ⓒ 

2. Look at the image to the right and respond to the question that follows.

True or False?
The hands on the clock are perpendicular to one another. _____
Explain how you know your answer is correct.

_____

_____

Day Two
Exit Ticket

Name: _____ Date: _____

1. Match the term with the correct symbol by writing the correct letter on the line next to the term.

Intersecting ____
Parallel ____
Perpendicular _____

Ⓐ 

Ⓑ 

Ⓒ 

2. Look at the image to the right and respond to the question that follows.

True or False?
The hands on the clock are perpendicular to one another. _____
Explain how you know your answer is correct.

_____

_____

Day Two
Exit Ticket

Name: _____ Date: _____

1. Match the term with the correct symbol by writing the correct letter on the line next to the term.

Intersecting __C__
Parallel __B__
Perpendicular __A__

Ⓐ 

Ⓑ 

Ⓒ 

2. Look at the image to the right and respond to the question that follows.

True or False?

The hands on the clock are perpendicular to one another. ___False_____

Explain how you know your answer is correct.

The hands on the clock meet at one point, which means they are intersecting. The two hands do not form a 90° angle when they meet. In order to be perpendicular they must meet at a 90° angle.

sketch Challenge

Name:_____ Date: _____

Follow the directions below. Only complete one step at a time. Take your time and do your best.

Steps	Sketch Area
1. Draw line $\overleftrightarrow{AB}$.	
2. Draw line segment $\overline{CD}$.	
3. Draw ray $\overrightarrow{EF}$ so that it intersects line $\overleftrightarrow{AB}$. *CLUE: Intersects symbol = $\#$	
4. Draw line segment $\overline{GH}$ parallel to line segment $\overline{CD}$. *CLUE: Parallel symbol = $//$	

sketch Challenge

Name: _____ Date: _____

Follow the directions below. Only complete one step at a time. Take your time and do your best.

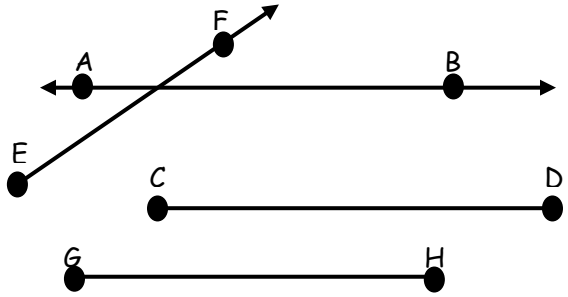
Steps	Sketch Area
1. Draw line $\overleftrightarrow{AB}$.	
2. Draw line segment $\overline{CD}$.	
3. Draw Ray $\overrightarrow{EF}$ so that it intersects ine $\overleftrightarrow{AB}$. *CLUE: Intersects symbol = $\#$	
4. Draw line segment $\overline{GH}$ parallel to line segment $\overline{CD}$. *CLUE: Parallel symbol = $//$	

sketch Challenge

Teacher Copy

Name: **EXAMPLE A** Date: _____

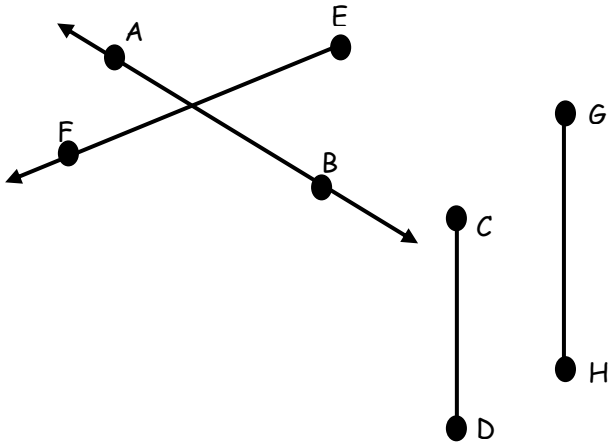
Follow the directions below. Only complete one step at a time. Take your time and do your best.

Steps	Sketch Area
5. Draw Line AB ($\overleftrightarrow{AB}$).	
6. Draw Line Segment CD ($\overline{CD}$).	
7. Draw Ray EF ($\overrightarrow{EF}$) so that it intersects Line AB ($\overleftrightarrow{AB}$). *CLUE: Intersects symbol = ⋕	
8. Draw Line Segment GH ($\overline{GH}$) parallel to Line Segment CD ($\overline{CD}$). *CLUE: Parallel symbol = //	

sketch Challenge

Name: **EXAMPLE B** Date: _____

Follow the directions below. Only complete one step at a time. Take your time and do your best.

Steps	Sketch Area
5. Draw Line AB ($\overleftrightarrow{AB}$).	
6. Draw Line Segment CD ($\overline{CD}$).	
7. Draw Ray EF ($\overrightarrow{EF}$) so that it intersects Line AB ($\overleftrightarrow{AB}$). *CLUE: Intersects symbol = ⋕	
8. Draw Line Segment GH ($\overline{GH}$) parallel to Line Segment CD ($\overline{CD}$). *CLUE: Parallel symbol = //	

Name: _____ Date: _____

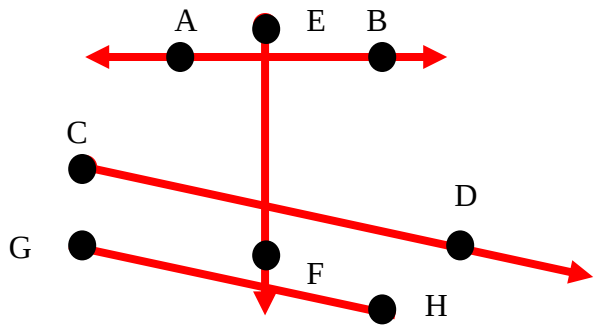
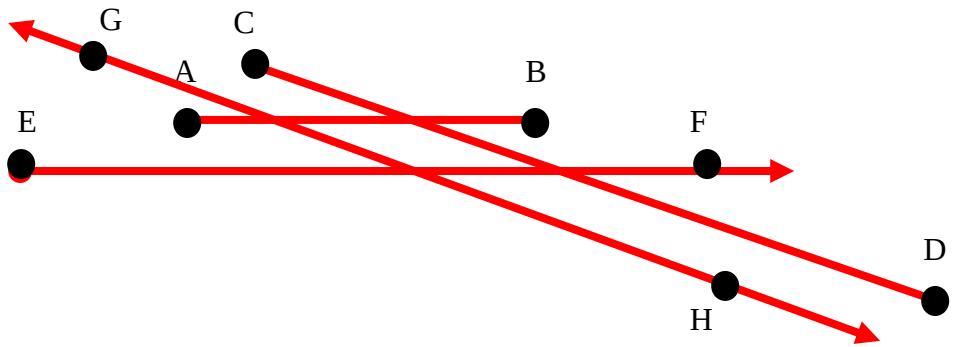
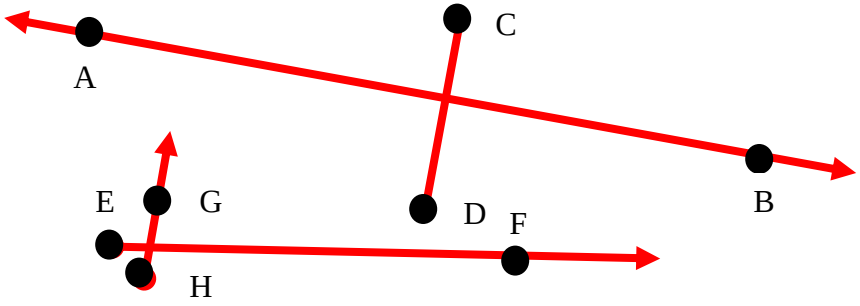
Step and Sketch Classwork

Directions	Sketch Space
1.) Draw a line, $\overleftrightarrow{AB}$.	
2.) Draw a ray, $\overrightarrow{CD}$.	
3.) Draw a ray, $\overrightarrow{EF}$, so that it is perpendicular to $\overleftrightarrow{AB}$.	
4.) Draw a line segment, $\overline{GH}$ so that it is parallel to $\overrightarrow{CD}$.	
1.) Draw a line segment, $\overline{AB}$.	
2.) Draw a line segment, $\overline{CD}$, so that it intersects $\overline{AB}$.	
3.) Draw a ray, $\overrightarrow{EF}$, so that it is parallel to $\overline{AB}$.	
4.) Draw a line, $\overleftrightarrow{GH}$, so that it is parallel to $\overline{CD}$.	
1.) Draw a line, $\overleftrightarrow{AB}$.	
2.) Draw a line segment, $\overline{CD}$, so that it makes a 90° with $\overleftrightarrow{AB}$.	
3.) Draw a ray, $\overrightarrow{EF}$.	
4.) Draw a ray, $\overrightarrow{GH}$, so that it intersects $\overrightarrow{EF}$.	

Name: _____ Date: _____

Step and Sketch Classwork

Teacher Key

Directions	Sketch Space
5.)Draw a line, $\overleftrightarrow{AB}$. 6.)Draw a ray, $\overrightarrow{CD}$. 7.)Draw a ray, $\overrightarrow{EF}$, so that it is perpendicular to $\overleftrightarrow{AB}$. 8.)Draw a line segment, $\overline{GH}$ so that it is parallel to $\overrightarrow{CD}$.	
5.) Draw a line segment, $\overline{AB}$. 6.) Draw a line segment, $\overline{CD}$, so that it intersects $\overline{AB}$. 7.) Draw a ray, $\overrightarrow{EF}$, so that it is parallel to $\overline{AB}$. 8.) Draw a line, $\overleftrightarrow{GH}$, so that it is parallel to $\overline{CD}$.	
5.) Draw a line, $\overleftrightarrow{AB}$. 6.) Draw a line segment, $\overline{CD}$, so that it makes a 90° with $\overleftrightarrow{AB}$. 7.) Draw a ray, $\overrightarrow{EF}$. 8.) Draw a ray, $\overrightarrow{GH}$, so that it intersects $\overrightarrow{EF}$.	

Name: _____

I Spy...LINES!

Date: _____

Directions: The two images below contain the same amount and types of lines. Use the key below to locate and color the differences between the two images. Then answer the questions about the images.

KEY

In both images, color line $\overleftrightarrow{AB}$ blue.

In both images, color line segment $\overline{CD}$ red.

In both images, color ray $\overrightarrow{EF}$ green.

In both images, color line segment $\overline{GH}$ orange.

In both images, color ray $\overrightarrow{IJ}$ brown.

In both images, color ray $\overrightarrow{LM}$ purple.

In both images, color line $\overleftrightarrow{NO}$ yellow.

In both images, color line segment $\overline{PQ}$ pink.

Questions

1.) In which image does $\overleftrightarrow{NO}$ intersect $\overrightarrow{IJ}$? _____

2.) In which image does $\overleftrightarrow{AB}$ intersect $\overline{GH}$? _____

3.) In which image are $\overleftrightarrow{AB}$ and $\overline{PQ}$ parallel? _____

4.) In which image are $\overline{GH}$ and $\overrightarrow{LM}$ perpendicular? _____

IMAGE # 1

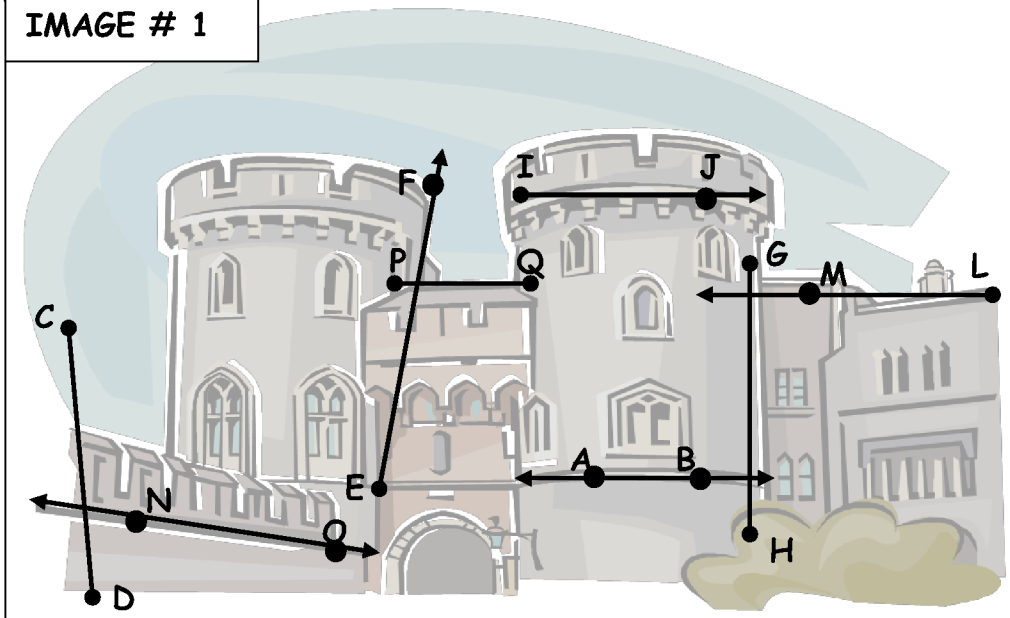
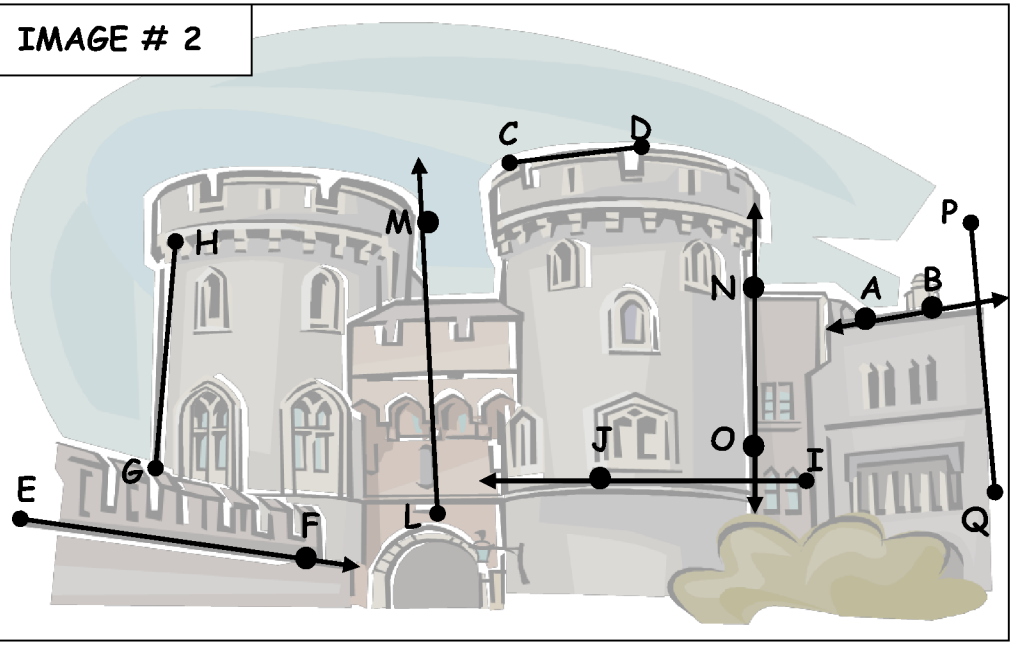


IMAGE # 2



Name: _____

I Spy...LINES!

Date: _____

Directions: The two images below contain the same amount and types of lines. Use the key below to locate and color the differences between the two images. Then answer the questions about the images.

KEY

In both images, color line $\overleftrightarrow{AB}$ blue.
In both images, color line segment $\overline{CD}$ red.
In both images, color ray $\overrightarrow{EF}$ green.
In both images, color line segment $\overline{GH}$ orange.
In both images, color ray $\overrightarrow{IJ}$ brown.
In both images, color ray $\overrightarrow{LM}$ purple.
In both images, color line $\overleftrightarrow{NO}$ yellow.
In both images, color line segment $\overline{PQ}$ pink.

Questions

5.) In which image does $\overleftrightarrow{NO}$ intersect $\overrightarrow{IJ}$? Image 2

6.) In which image does $\overleftrightarrow{AB}$ intersect $\overline{GH}$? Image 1

7.) In which image are $\overleftrightarrow{AB}$ and $\overline{PQ}$ parallel? Image 1

8.) In which image are $\overline{GH}$ and $\overrightarrow{LM}$ perpendicular? Image 1

IMAGE # 1

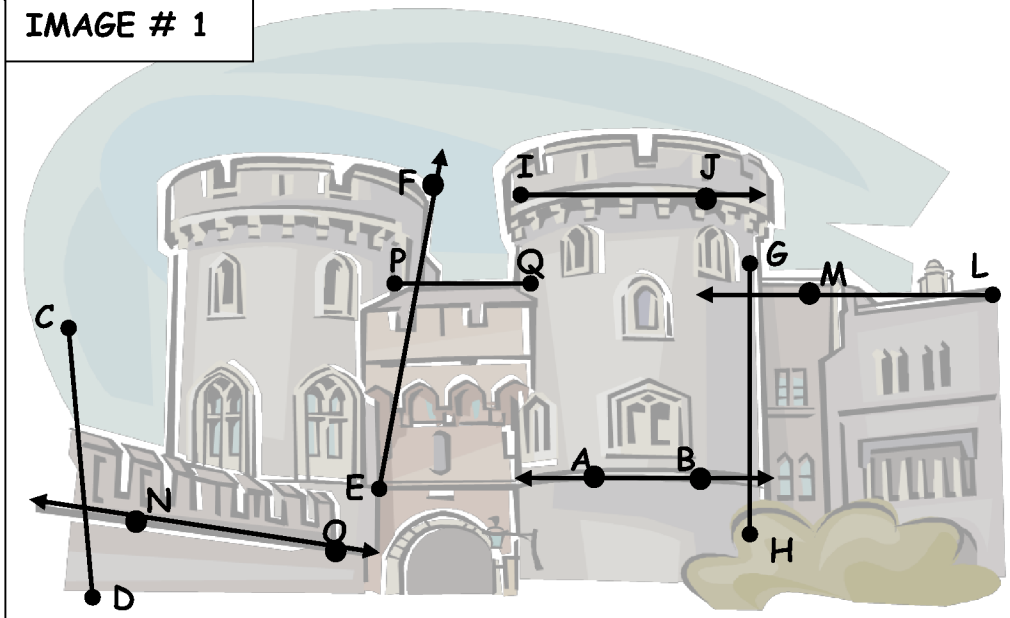
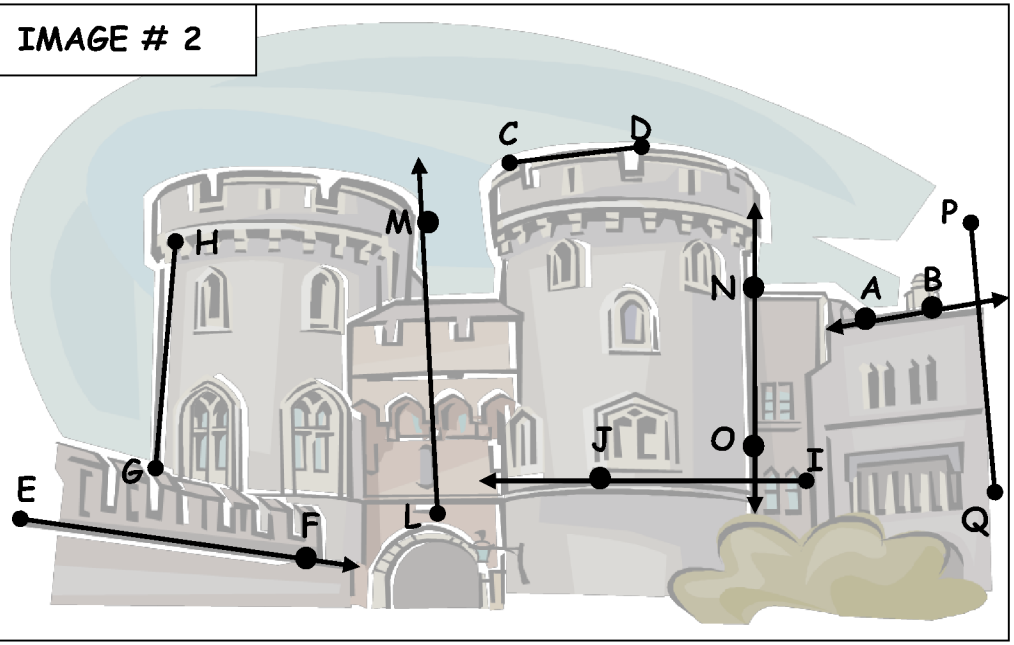


IMAGE # 2



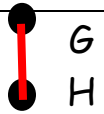
Name: _____ Date: _____

Say, Look, Combine!

Say	Look	Combine
1) Draw a line segment, $\overline{AB}$.		
2) Draw a line, $\overleftrightarrow{CD}$, that is parallel to AB.		
3) Draw a ray, $\overrightarrow{EF}$, which intersects CD.		
4) Draw a line segment, $\overline{GH}$, which faces up and down.		
1.) Draw a line, $\overleftrightarrow{AB}$.		
2.) Draw a line segment, $\overline{CD}$.		
3.) Draw a ray $\overrightarrow{EF}$, which is perpendicular to CD.		
4.) Draw a ray, $\overrightarrow{GH}$, which intersects $\overleftrightarrow{AB}$.		
1.) Draw a ray, $\overrightarrow{AB}$, which faces right.		
2.) Draw a line segment, $\overline{CD}$.		
3.) Draw a line, $\overleftrightarrow{EF}$, which is parallel to $\overline{CD}$.		
4.) Draw a line segment, $\overline{GH}$, which makes a 90° angle with any line.		

Name: _____ Date: _____

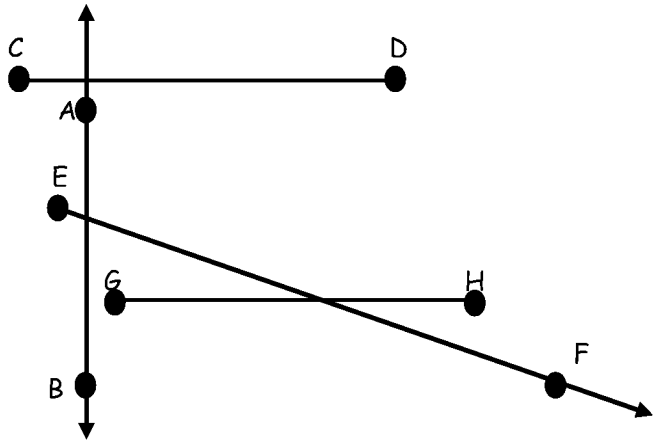
Say, Look, Combine! Teacher Key

Say	Look	Combine
1.) Draw a line segment, $\overline{AB}$.		Answers will vary. Accept any that follow the guidelines under "SAY."
2.) Draw a line, $\overleftrightarrow{CD}$, that is parallel to AB.		
3.) Draw a ray, $\overrightarrow{EF}$, which intersects CD.		
4.) Draw a line segment, $\overline{GH}$, which faces up and down.		
1.) Draw a line, $\overleftrightarrow{AB}$.		Answers will vary. Accept any that follow the guidelines under "SAY."
2.) Draw a line segment, $\overline{CD}$.		
3.) Draw a ray $\overrightarrow{EF}$, which is perpendicular to CD.		
4.) Draw a ray, $\overrightarrow{GH}$, which intersects $\overleftrightarrow{AB}$.		
1.) Draw a ray, $\overrightarrow{AB}$, which faces right.		Answers will vary. Accept any that follow the guidelines under "SAY."
2.) Draw a line segment, $\overline{CD}$.		
3.) Draw a line, $\overleftrightarrow{EF}$, which is parallel to $\overline{CD}$.		
4.) Draw a line segment, $\overline{GH}$, which makes a 90° angle with any line.		

Geometry Challenge

Name: _____ Date:_____

1.) Look at the sketch below. Based on the sketch, create sequential steps that could be followed to create the sketch that already exists. The first one has been done for you.

Steps	Sketch Area
9. Draw Line AB ($\overleftrightarrow{AB}$). _____	
10. _____	
11. _____	
12. _____	

*CLUE: Intersects symbol = ⨯ *CLUE: Parallel symbol = // *CLUE: Perpendicular symbol = ⊥

2.) Create four steps for a partner to follow. Make sure your steps are specific and clear. Once you have written your steps, create an Answer Key Sketch on a separate sheet of paper. Then, give your steps to a partner to complete. Check their work when they are done.

Steps	Sketch Area
1. _____	
2. _____	
3. _____	
4. _____	

Day Three
Exit Ticket

Name: _____ Date: _____

Directions: Follow the steps below to create an image in the Sketch Area.

Steps	Sketch Area
13. Draw line segment $\overline{AB}$.	
14. Draw ray $\overrightarrow{CD}$.	
15. Draw line $\overleftrightarrow{EF}$ parallel to line segment $\overline{AB}$.	
16. Draw ray $\overrightarrow{GH}$ so that it is perpendicular to ray $\overrightarrow{CD}$.	

Day Three
Exit Ticket

Name: _____ Date: _____

Directions: Follow the steps below to create an image in the Sketch Area.

Steps	Sketch Area
1. Draw line segment $\overline{AB}$.	
2. Draw ray $\overrightarrow{CD}$.	
3. Draw line $\overleftrightarrow{EF}$ parallel to line segment $\overline{AB}$.	
4. Draw ray $\overrightarrow{GH}$ so that it is perpendicular to ray $\overrightarrow{CD}$.	

Name: _____

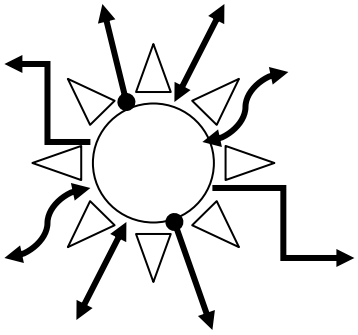
Geometry Unit Summative Assessment

Use what you know to answer the questions below.

2. Select the statement that best describes the image below.

D. This image is a line segment.
E. This image is a line.
F. This image is a ray.

2. Find the 2 lines in the sun below. Circle both of them.

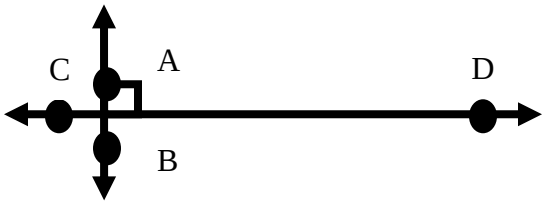


3. Draw a line parallel to the line below.	4. Draw a line perpendicular to the line below.	5. Draw a line that intersects the line below.

6. Which statement is **not true?**

Ⓐ Parallel lines are the same length apart and never touch.
Ⓑ Line segments have two endpoints.
Ⓒ Perpendicular lines form 45° angles.
Ⓓ Intersecting lines have one common point.

Step A:
Look at the image below. Name the two lines below.



_____ and _____

Step B:
Tell whether these two lines are parallel, intersecting, or perpendicular.

Explain why your answer is correct.
Use what you know about geometry in your explanation.
Use words and/or numbers in your explanation.

_____

_____

_____

_____

_____

_____

_____

_____

Name: _____

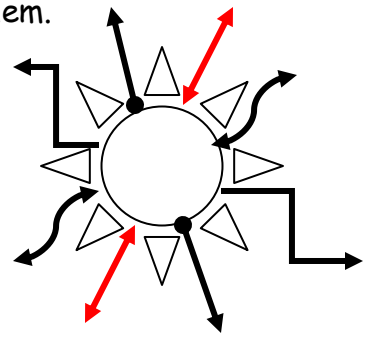
Geometry Unit Pre-Assessment- Teacher Key

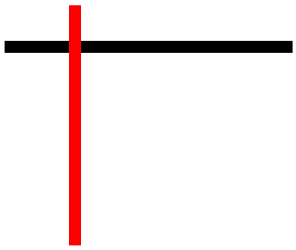
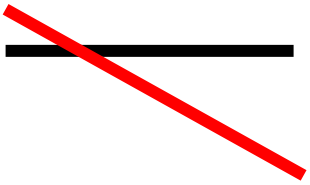
Use what you know to answer the questions below.

1. Select the statement that best describes the image below.

A. This image is a line segment.
B. This image is a line.
C. This image is a ray.

2. Find the 2 lines in the sun below. Circle both of them.

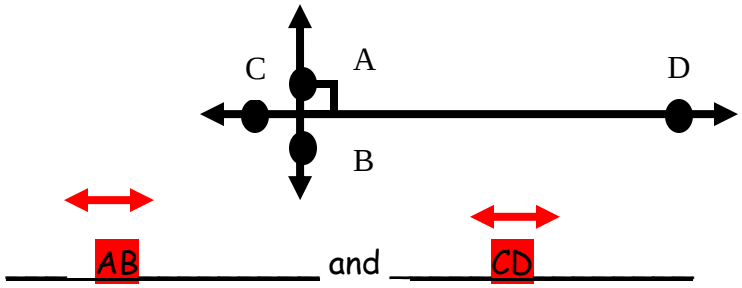


3. Draw a line parallel to the line below.	4. Draw a line perpendicular to the line below.	5. Draw a line that intersects the line below.
		

6. Which statement is **not true?**

Ⓐ Parallel lines are the same length apart and never touch.
Ⓑ Line segments have two endpoints.
Ⓒ Perpendicular lines form 45° angles.
Ⓓ Intersecting lines have one common point.

Step A:
Look at the image below. Name the two lines below.



$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$

Step B:
Tell whether these two lines are parallel, intersecting, or perpendicular.

Explain why your answer is correct.
Use what you know about geometry in your explanation.
Use words and/or numbers in your explanation.

Sample Response:

$\overleftrightarrow{AB}$ is perpendicular to $\overleftrightarrow{CD}$. I know perpendicular lines form at least one 90° angle when they intersect, and the symbol shows one of the angles is 90°. So, I know $\overleftrightarrow{AB} \perp \overleftrightarrow{CD}$.